

**DISTRIBUTIONS OF THE SCORPIONS *CENTRUROIDES*  
*VITTATUS* (SAY) AND *CENTRUROIDES HENTZI* (BANKS)  
IN THE UNITED STATES AND MEXICO  
(SCORPIONES, BUTHIDAE)**

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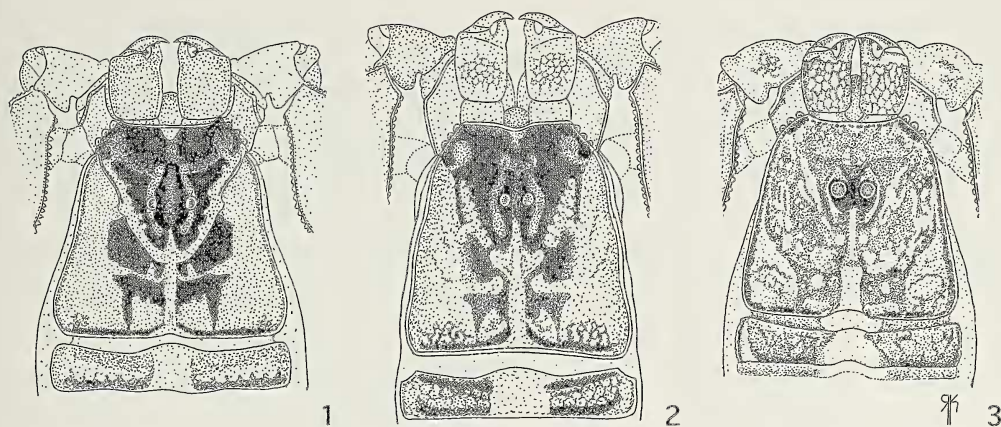
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**ABSTRACT.** Specific locality records are presented to define the distributions of the scorpions *Centruroides vittatus* (Say) and *C. hentzi* (Banks) in North America. The former occurs in the Central Plains as far north as Thayer County, Nebraska; the Rio Grande and Sangre de Cristo Mountains form the western distributional boundary, and the Missouri and Mississippi Rivers essentially do likewise on the east. *Centruroides vittatus* occurs just across the latter watercourses in Holt County, Missouri, and Monroe and Randolph counties, Illinois, range extensions that probably can be attributed to rafting or natural alterations in the rivers' courses. Other occurrences east of the Mississippi River, in northern Illinois, Kentucky, Tennessee, Louisiana, Mississippi and North Carolina, are associated with cities and are mostly far outside what we consider the natural range; such records are regarded as human introductions. One of these apparently represents a viable reproducing population in Rutherford County, Tennessee. Likewise, records far west of the Rio Grande, in Arizona and California, are interpreted as introductions. *Centruroides vittatus* traverses the Rio Grande south of Texas and occurs in Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas, Mexico. *Centruroides hentzi*, previously known only from Florida in the United States, occurs in Mobile and Baldwin counties, Alabama, and in the southern tier of counties in Georgia. Occurrences of *C. hentzi* in Durham, Carteret, and Brunswick counties, North Carolina, Charleston County, South Carolina, and Harris and Muscogee counties, Georgia, are considered to represent accidental human importations, although it is also possible that the more proximal ones are peripheral isolates.

The scorpion fauna of the United States east of the Mississippi River is depauperate in comparison to that of the southwest. According to Muma (1967), five species – *Tityus floridanus* Banks, *Isometrus maculatus* (DeGeer), *Centruroides gracilis* (Latreille), *C. hentzi* (Banks), and *C. keysi* Muma – occur in Florida. Presently, *T. floridanus* is a synonym of *T. dasyurus* Pocock, from Puerto Rico and the Virgin Islands (Lour-enço & Francke 1984), and *C. keysi* is considered a synonym of *C. guanensis* Frangillo, from Cuba, Hispaniola, and the Bahamas (de Armas 1981). The first two species are known in Florida only from single individuals ostensibly collected at Key West. These records are questionable, and *C. gracilis*, *hentzi* and *guanensis* are the only scorpions that will be encountered frequently in the state, if not the only ones actually occurring there. Elsewhere in the East, the only known native scorpion is *Vaejovis carolinianus* (Beauvois), an upland species occurring primarily north and

west of the Fall Zone as far north as the Ohio River in central Kentucky (Shelley 1994a).

Say (1821) described "*Buthus vittatus*" from the "sea islands" of Georgia, but his type specimen(s) are lost, and this name, long associated with the common midwestern species of *Centruroides*, was formally assigned to it (Opinion 1680, 1992) in response to the petition by Stockwell & Levi (1989), as subsequently modified by respondent comments (Gentry et al. 1991). As part of this opinion, a neotype of *B. vittatus* was designated from Kinney County, Texas, instead of Georgia. Say's locality record plausibly refers to *C. hentzi*, which occurs statewide in Florida (Muma 1967), but up to now is not supported by preserved specimens. *Centruroides hentzi* and *vittatus* have been introduced into North Carolina (Shelley 1994b), and newspaper articles have reported scorpions from Kiawah Island and Isle of Palms, near Charleston, South Carolina (Langley 1991, 1994). These two scorpions are



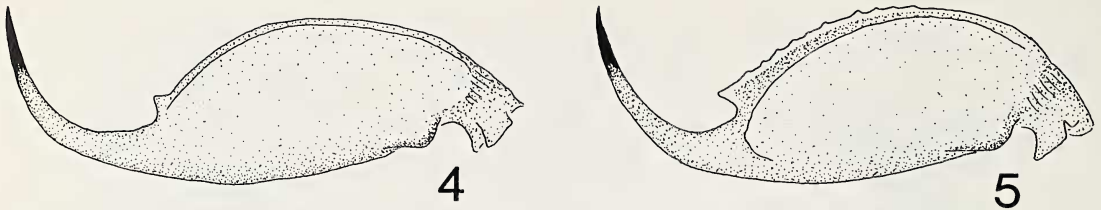
Figures 1–3.—Comparisons between *Centruroides vittatus* and *C. hentzi* in color pattern. 1, 2, Dorsal views of carapace and chelicerae of *C. vittatus*; 3, Same for *C. hentzi*.

readily distinguished at any life stage by the characters in Table 1, which also serve to distinguish *C. vittatus* from *C. guanensis* (= *C. keysi*). Differences in the pigmentations of the chelicerae and carapaces, and in the configurations of the telsons, are shown in Figs. 1–5.

While recently examining museum specimens, we encountered samples of *C. hentzi* from southern Alabama and Georgia, thus establishing its occurrence north and west of Florida. The museum holdings also included numerous new records of *C. vittatus* that enable a detailed description of its distribution. This distribution has been generally described as Louisiana west of the Mississippi River to New Mexico east of the Rio Grande, and from the Central Plains of the United States to northern Mexico (Stahnke & Calos 1977; Stockwell & Levi 1989; Shelley 1994b). However, it is striking to note that, aside from Las Vegas, San Miguel County, New Mexico (Banks 1901); Cleveland, Garvin, and Seminole counties, Oklahoma (cited as *Centrurus carolinianus* by Banks et al. 1932); the Wichita Mountains, Comanche County, Oklahoma (Coken-dolpher & Bryce 1980); and Thayer County, Nebraska (Rapp 1987), few definite United States records exist outside of Texas, where *C. vittatus* can be anticipated statewide with perhaps the exception of several southeastern coastal counties. Published Mexican records (Hoffmann 1932; Diaz Najera 1975) are as follows: Cd. Juarez in Chihuahua; Cd. Acuna, Allende, Cuatro Ciene-gas, Lamadrid, and Sacramento in Coahuila; Hidalgo in Nuevo Leon; and Barrotal, Cd. Aleman,

Guerrero, Matamoros, and San Fernando in Tamaulipas.

It is our purpose here to place the new samples on record, update the known distributions of these scorpions in the United States and Mexico, and provide additional habitat information based on notations on vial labels. Acronyms for sources of preserved material are as follows: AMNH - American Museum of Natural History, New York, New York; ANSP - Academy of Natural Sciences, Philadelphia, Pennsylvania; CAS - California Academy of Sciences, San Francisco; CC - Biology Department, Columbus College, Columbus, Georgia; CIM - Cumberland Island Museum, St. Marys, Georgia; FMNH - Field Museum of Natural History, Chicago, Illinois; FSCA - Florida State Collection of Arthropods, Gainesville; INHS - Illinois Natural History Survey, Champaign; LSU - Entomology Department, Louisiana State University, Baton Rouge; MCZ - Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; MEM - Mississippi Entomological Museum, Mississippi State University, Starkville; MMNS - Mississippi Museum of Natural Science, Jackson; MPM - Milwaukee Public Museum, Milwaukee, Wisconsin; MWSU - Midwestern State Univ., Wichita Falls, TX; NCSM - North Carolina State Museum of Natural Sciences, Raleigh; NCSU - Entomology Department, North Carolina State University, Raleigh; NMNH - National Museum of Natural History, Smithsonian Institution, Washington, DC; OKSU - Emerson Entomological Museum, Oklahoma State University, Still-



Figures 4–5.—Differences in telson morphology between *Centruroides vittatus* and *C. hentzi*. 4, Lateral view of telson of *C. vittatus*; 5, Same for *C. hentzi*.

water; OMNH - Oklahoma Museum of Natural History, University of Oklahoma, Norman; PMNH - Peabody Museum of Natural History, Yale University, New Haven, Connecticut; RNH - Private collection of R. N. Henson, Boone, North Carolina; SEM - Snow Entomological Museum, University of Kansas, Lawrence; SFASU - Biology Department, Stephen F. Austin University, Nacogdoches, Texas; TAMU - Texas A & M University, College Station; TMM - Texas Memorial Museum, University of Texas at Austin; TY - private collection of T. Yamashita; UCO - University of Colorado Museum, Boulder; UGA - University of Georgia Museum of Natural History, Athens; UMN - Entomology Department, University of Minnesota, St. Paul; UMO - Enns Entomological Museum, University of Missouri, Columbia; UTEP - Biology Department, University of Texas at El Paso; WDS - Private collection of W. D. Sissom, Canyon, Texas; WFR - Private collection of W. F. Rapp, Crete, Nebraska; WTAMU - Department of Biology and Geosciences, West Texas A&M University, Canyon, Texas.

*Centruroides vittatus*

Figs. 1, 2, 4, 6, 7

**Habitat.**—As reported by Shelley (1994b) and recorded through personal observations, *C. vittatus* occupies a variety of microhabitats in deserts, deciduous and pine forests, and grasslands, inhabiting crevices of rocky outcrops, canyon walls, and volcanic hills, climbing into vegetation, seeking refuge beneath yuccas and in trash dumps, and commonly entering houses. It has been collected from sea level to elevations of over 1800 m in the Guadalupe and Chisos Mountains, Texas and 2340 m in mountains of Coahuila, Mexico. Additional microhabitats cited on labels with the present samples include under palm branches, rocks, bark and logs in a pine forest, cow dung, and old rags and debris at an aban-

doned campsite; in a sabal palmetto grove; in the nest of a cactus rat; and in a molasses trap left overnight. Specimens were found in homes, motels, dormitories, and office buildings in Cole, St. Louis, and Taney counties, Missouri; Orleans Parish, Louisiana; Alfalfa, Kay, Marshall, Muskogee, Pawnee, Payne, and Stephens counties, Oklahoma; and DeBaca and Eddy counties, New Mexico. An individual from San Miguel County, New Mexico, was encountered inside the Las Vegas hospital.

**Distribution.**—*Centruroides vittatus* has officially been recorded from only 16 Texas counties—Andrews, Brewster, DeWitt, Edwards, Erath, Garza, Hall, Kinney, Lubbock, Mason, Parker, Travis, Uvalde, Val Verde, Williamson, and Wise (Reddell 1965, 1970; Rowland & Reddell 1976; Stockwell & Levi 1989; Formanowicz & Shaffer 1993). Although overlooking a number of significant collections, Stockwell (1986) reported it from 50 additional counties in an unpublished Master's Thesis: Archer, Bexar, Blanco, Cameron, Clay, Coke, Crockett, Crosby, Culberson, Dallas, Foard, Gillespie, Gonzales, Grayson, Hidalgo, Jeff Davis, Johnson, Kaufman, Kent, Kerr, Kimble, King, Knox, LaSalle, Maverick, McMullen, Medina, Menard, Motley, Navarro, Oldham, Pecos, Presidio, Real, Reeves, San Patricio, San Saba, Schleicher, Starr, Sutton, Taylor, Terrell, Tom Green, Victoria, Ward, Webb, Wichita, Winkler, Zapata, and Zavala. These records are scattered across the state, and the scorpion is now known from bordering states in the United States and Mexico in all directions. We therefore believe that *C. vittatus* can be anticipated in every Texas county except perhaps Orange, Jefferson and Chambers, along the Gulf Coast east of Galveston Bay. Present records from Louisiana do not support its occurrence in this corner of Texas, and field collecting is needed in these counties and in Calcasieu and Cameron Parishes, Louisiana, to confirm or refute this

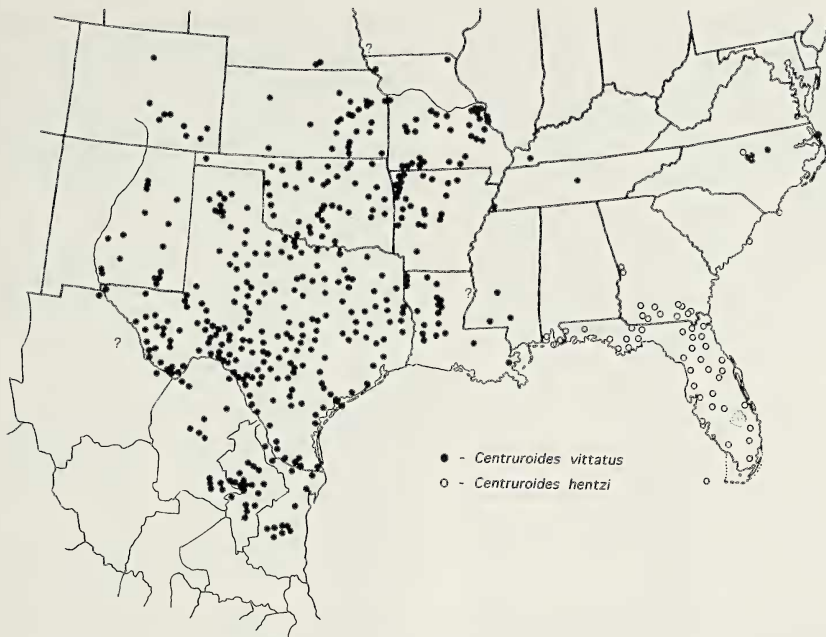


Figure 6.—Distributions of *C. vittatus* (closed circles) and *C. hentzi* (open circles) in the United States and Mexico. Florida records for *C. hentzi* are for counties only and are partially based on Muma (1967). The approximate courses of the Missouri River and the Rio Grande are indicated in Missouri and New Mexico/Colorado, respectively. The “?” in Iowa and Louisiana denotes the records from unknown counties along the Missouri and Mississippi Rivers, respectively. The “?” in Chihuahua, Mexico reflects our lack of knowledge on the extent of the distribution of *C. vittatus* in this region, which has been so poorly sampled.

finding. Large numbers of samples from Texas exist in many museum collections, too many to be shipped for examination. We therefore list only additional Texas county records that were intermingled with material from other states, but plot all known localities accurately on Fig. 6.

Determining the natural distribution of *C. vittatus*, and to a lesser extent *C. hentzi*, is hampered by the number of specimens that man has accidentally transported into new areas, which tend to mask the indigenous range. Samples from distant states like California and North Carolina clearly represent human introductions, but ones from proximate sites like Memphis, Tennessee and Baton Rouge, Louisiana could plausibly reflect peripheral native populations. Mapping of all the samples, however, reveals clusters of records that we believe represent natural occurrence; we use them as the basis for determining indigenous distributions, particularly when detached records are from urban environments and are consistent with human activities. Thus, as shown in Fig. 7, the eastern border formed by clustered records angles southwestward through southeastern Missouri into Arkansas, and then

runs through central Arkansas and Louisiana before turning westward into Texas, omitting the adjoining coastal corners of Louisiana and Texas. The only outlying records along this boundary are from the urban environments of Baton Rouge and Memphis, and are therefore treated as human introductions.

The overall distribution of *C. vittatus* (Fig. 6) extends southward from Thayer County, Nebraska, and expands longitudinally to encompass all of Oklahoma, Arkansas, and Missouri south of the Missouri River. The Rio Grande in southern New Mexico and the Sangre de Cristo Mountains in northern New Mexico and south central Colorado form the western geographical boundary, and present Colorado records suggest westward expansion through the Arkansas River Valley. The only available records from the western half of Kansas are sight records from Clark and Trego counties, so collecting is needed to determine the distribution in this part of the state. The Missouri and Mississippi Rivers essentially form distributional boundaries, as the only natural occurrences to the north/east of the former, in Holt County, Missouri, and to the east of the

latter, in Monroe and Randolph counties, Illinois, are in bordering counties that could have resulted from rafting or natural alterations of the rivers' courses; the Illinois records are directly across the Mississippi from an area where the scorpion is common in Missouri. However, other sites east of the Mississippi, mostly urban areas, represent obvious adventives. The range traverses the Rio Grande south of Texas, and *C. vittatus* is known from over half the lengths of Tamaulipas, Nuevo Leon, and Coahuila, and the northern periphery of Chihuahua.

### NEW RECORDS

Specimens that are considered to represent the native distribution were examined from the following localities. Missing data (exact locality, date of collection, and collector(s)) are not reported. Sight records deemed reliable from additional counties are presented separately for each state after the locality listings but are plotted in Fig. 6.

USA: **ARKANSAS:** *Benton County*, Pea Ridge Natl. Battlefield, 23 April 1965, J. D. Unzicker (INHS). *Boone County*, Harrison, Conard Fissure, 8 June 1932, F. D. Wood (PMNH). *Cleburne Co.*, 9.6 km SSW Drasco, September 1979, D. Pearson (MPM). *Crawford County*, 14.4 km N Mountaintown, Boston Mts., 30 June 1955, T. J. Cohn (AMNH); and Lee Creek, 9 July 1968, R. & A. Graves (FSCA). *Faulkner County*, 12.8 km N Camp Robinson, 21 April 1943, D. D. Davis (FMNH); Camp Robinson, 24 March 1943, R. C. Ellis (FMNH). *Franklin County*, 6.4 km N Ozark, along AR hwy. 23, 12 October 1963 and 15 September 1964, Unzicker, Yamamoto, Rotramel (INHS). *Garland County*, 17.6 km W Hot Springs, 21 March 1958, K. P. Schmidt. *Izard County*, May 1954, H. M. Bevel (MCZ). *Logan County*, Mt. Magazine, 21 June 1938, J. M. Schmidt (FMNH), 13 August 1966 and 13 April 1976, L. D. Newsome (LSU), and 15 July 1949, M. W. Sanderson, Stannard (INHS); 1.6 km S Ione, along AR hwy. 23, 15 September 1964, J. D. Unzicker (INHS); and 16 km S Booneville, along AR hwy. 23, 12 October 1963, Unzicker, Yamamoto (INHS). *Marion County*, 6.4 km SW Oakland, Ozark Isle Park, Bull Shoals L., 28 July 1970, P. J. Clausen (FSCA). *Nevada County*, 30 December 1954, N. B. Causey (MCZ). *Newton County*, Buffalo National River, near Pruitt, no date, T. Yamashita (TY). *Perry County*, Williams Jct., Ouachita Mts., 19 July 1968, E. N. K. Waering (FSCA). *Pike County*, Kirby, 9 June 1970 (WTAMU); and Glenwood, 23 July 1973 (WTAMU). *Polk County*, Mena, 10 March 1956, N. B. Causey (MCZ). *Pulaski County*, North Little Rock, 26 April 1962, J. Ball (MCZ); Little Rock, summer 1943, E. M. Nelson (FMNH); Pinnacle Mt. State Park, no date, T. Yamashita (TY); Camp Robinson, 9 May 1944, L. Hook (AMNH); and 12.9

Table 1.—Morphological differences between *C. vittatus* and *C. hentzi* and *C. guanensis* (= *C. keysi*).

<i>C. vittatus</i>	<i>C. hentzi/C. guanensis</i>
1. Carapace with black inverted triangle covering ocular tubercle (Figs. 1–2)	Carapace uniformly light mottled brown (Fig. 3)
2. Dorsal surface of chelicerae usually uniformly yellowish (Fig. 1), occasionally with trace of reticulation (Fig. 2)	Dorsal surface of chelicerae with distinct brown reticulation (Fig. 3)
3. Pedipalp chela fingers and manus uniformly yellowish; all pedipalpal segments uniformly yellowish	Pedipalp chela fingers infuscate; pedipalpal segments with dusky marbling
4. Median yellow stripe of dorsum as wide or wider than black stripes (when stripes are present)	Median yellow stripe usually about half as wide as black stripes
5. Higher pectinal tooth counts Male: 21–30 Female: 20–27	Lower pectinal tooth counts Male: 17–19 Female: 16–18
6. Metasomal segments with a single solid dusky midventral stripe lying between ventral submedian carinae	Metasomal segments with entire ventral aspect of metasomal segments infuscate with pale spots marking positions of setae
7. Legs usually immaculate yellow, rarely faintly infuscate	Legs moderately to heavily infuscate
8. Telson suboval when viewed from ventral aspect	Telson broadest apically, with subtle "shoulders"
9. Telson midventrally with very weak smooth, longitudinal carina leading into subaculear tubercle (Fig. 4)	Telson ventrally with moderate, crenulate carina leading into subaculear tubercle (Fig. 5)
10. Subaculear tooth small, spinoid (Fig. 4)	Subaculear tooth larger, angular (Fig. 5)

km N Camp Robinson, 21 April 1943, D. D. Davis (FMNH). *Scott County*, nr. Boles, 9 September 1967, D. M. Smith (INHS). *Sharp County*, 0.4 km SW Ash Flat, 16 September 1964 (INHS). *Washington County*, 24 km W Prairie Grove, Cove Cr. Valley, Boston Mts., February 1956, M. Hite (MCZ); Prairie Grove, 20 October 1955, M. Hite (MCZ); Fayetteville, no date, T.

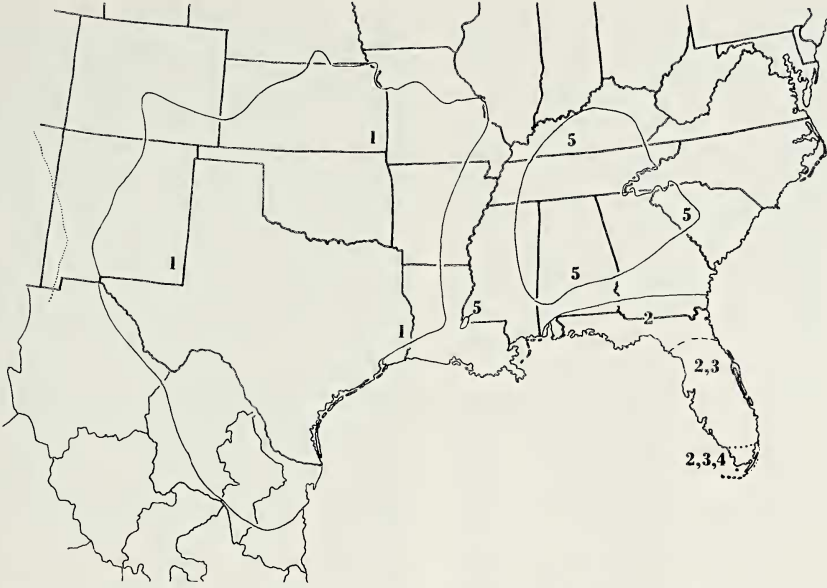


Figure 7.—Comparisons of native distributions of scorpions in the United States and northern Mexico, emphasizing those species occurring in eastern and southcentral United States. 1, *C. vittatus*; 2, *C. hentzi*; 3, *C. gracilis*; 4, *C. guanensis* (= *C. keyssi*); 5, *Vaejovis carolinianus*. The dotted line in western New Mexico and Arizona indicates the eastern boundary of the range of *C. exilicauda* (Wood); the boundary in New Mexico is based on the unpublished data of the junior author.

Yamashita (TY); Fayetteville, 4 October 1938, L. G. Hembest (NMNH) and 19 July 1953, N. B. Causey (MCZ); and 40 km W Fayetteville, 20 July 1969, A. Graves (FSCA). Sight records (T. Yamashita, in litt. to second author): Lake Ouachita (several sites, all rocky areas) in Hot Springs Co. **COLORADO**: *Baca County*, Regnier, ca. 36.8 km S Pritchett, Comanche Nat. Grassland (AMNH). *Fremont County*, 0.8 km W Canon City, 5 September 1958, A. W. Spencer (CAS); and Canon City, June 1968, R. L. Kaesler (SEM), and outside Fly Cv., 28 August 1961, W. J. Gertsch, W. Ivie (AMNH). *Las Animas County*, along CO hwy. 109, 21 June–11 July 1966 (AMNH). *Otero County*, along CO hwy. 109, 6 July 1967 (AMNH). *Prowers County*, Two Buttes Reservoir, 3–19 July 1966 (AMNH). *Pueblo County*, Boone, 6 July–1 August 1967 (AMNH); along CO hwy. 78, 16 March 1963–15 August 1964 (AMNH); and Lime, ca. 16 km S, 3.2 km E Pueblo, 12 May year unknown, Brookhart (AMNH). **ILLINOIS**: *Monroe County*, 6.4 km N Fults, 9 April 1949, D. M. Smith (INHS); 4 km N Fults, 13 July 1949, A. G. Wright (INHS); Fults, 9 October 1948 and 16 June 1949, P. W. Smith (CAS, INHS), 15 July 1953, Hensley & Smith (INHS), and spring 1971, D. Daleske (FMNH); and 6.4 km S Valmeyer, 1 May 1956, P. W. Smith (INHS). *Randolph County*, 3.2–4.8 km N Prairie du Rocher, October 1980, R. W. Sites (UMO); and Prairie du Rocher, 28 June 1949, Smith & Stannard (INHS) and 29 September 1982, J. H. Gerrard (AMNH). **KANSAS**: *Allen County*, Humboldt, 24 August 1944 (CAS).

*Chase County*, 2.4 and 4.8 km S Saffordville, 24 June 1964 and 10 May 1965, R. F. Clarke (CAS), and 11.2 km S Saffordville, 20 June 1965, R. Zwiefel (AMNH); 8 km S Strong City, 4 June 1957, C. E. Goulden (CAS); and east edge L. Kahola, 17 June 1965, R. F. Clarke (CAS). *Chautauqua County*, 4.8 km W Peru, 3 April 1933, C. E. Burt (NMNH). *Cowley County*, Winfield vic., 1933, C. E. Burt, B. Anderson (NMNH). *Douglas County*, Lawrence, B. C. Marshall (ANSP), 10 October 1947 (CAS), 28 April 1948 (INHS), and 22 September 1962 (SEM); Lawrence, no date, T. Yamashita (TY); prairie outside Lawrence, 3 May 1964, S. Roth (CAS); 4.8 km W Lawrence, Clinton Lake Rec. Area, 9 May 1993, B. Cutler (UMN); and Rock Cr., 3 May 1899 (NMNH). *Lyon County*, Emporia, 14 May and 21 September 1966 (CAS), B. C. Marshall, 17 April 1966, R. F. Clarke (CAS). *Reno County*, Hutchinson, 27 July 1951 (CAS). *Riley County*, Manhattan, 10–19 September 1904 (MCZ) and 1927, C. E. Burt (NMNH). *Wilson County*, Altoona, Neodesha Region, 11 August 1977, Gordon (FMNH). *Woodson County*, Toronto (CAS). *Wyandotte County*, Kansas City (NMNH). Sight records (B. Cutler, in litt. to first author): Butler, Cherokee, Clark, Elk, Trego, and Wabaunsee counties. **LOUISIANA**: *Allen Parish*, 16 February 1963, D. A. Rossman (LSU). *Beauregard Parish*, DeRidder, 1943, E. L. Bell (AMNH); and 41.6 km N Lake Charles, 10–17 August 1941, E. L. Bell (AMNH). *Caddo Parish*, Ida, 11 June 1972, F. H. Eubanks (CAS); Blanchard, 14 February 1967, K. Howard (CAS); and Shreveport,

24 March 1962 (MCZ). *Caldwell Parish*, 10.1 km E Columbia Heights, along LA hwy. 4, 3 April 1966, R. E. Tandy (FSCA). *Claiborne Parish*, Homer, 24 January 1953, N. B. Causey (MCZ). *Evangeline Parish*, Chicot St. Pk., 25 November 1944, W. G. Moore (NMNH). *Grant Parish*, Kisatchie Nat. For., 1 April 1962, G. Pontiff (LSU); Kisatchie Nat. For., Longleaf Vista, no date, T. Yamashita (TY); 5.6 km N Williana, 10 May 1954, H. S. Dybas (FMNH); nr. Williana, 19 October 1953, Dybas (FMNH); and Dry Prong, 9 May 1954, Dybas (FMNH). *Jackson Parish*, Wyatt, 1 September 1941 (AMNH). *Lincoln Parish*, Ruston, 10 July 1950, M. Cazier (AMNH) and 11 April 1960, D. Copeland (CAS); and 8 km E Ruston, 4 January 1961 (LSU). *Rapides Parish*, Alexandria, H. W. Tobias (NMNH); Kisatchie Nat. For., Johnson Tract, 30 December 1958, D. J. Pirone (AMNH); Forest Hill, 11 November 1945, R. L. Wenzel (FMNH); Melder, Fall 1941, E. L. Bell (AMNH); and Camp Claiborne, 28 March 1969, F. C. Rabalais (LSU). *Sabine Parish*, 12.8 km NNW Many, 10 September aa 3 October 1942, E. C. Williams (FMNH). *Vernon Parish*, 6.4 km NE Leesville, 19 April 1962, K. Arnold (LSU); and 4.3 km NE Caney, 8 April 1967, L. D. Wilson (FSCA). **MISSOURI**: *Barry County*, Roaring River St. Pk., 9 May 1936, E. G. Fisher (ANSP); and Washburn, 14 May 1930, H. H. Shamel (NMNH). *Benton Co.*, nr. Warsaw, 0.8 km N jct. MO hws. 7 & UU, E. G. Riley (UMO); and 4.8 km NW Warsaw, 10 April 1968, J. R. Heitzman (FSCA). *Carter County*, Fremont, 6 January 1942 (CAS). *Christian County*, 2 August 1976, T. J. Riley (UMO). *Cole County*, 9.6 km SE Russellville, 23 March 1958, H. D. Raitheo (CAS). *Hickory County*, 4.8 km E Wheatland, 20 April 1976, R. Sajdak, J. Buday (MPM). *Holt County*, 8 km S Forest City, 12 May 1992, A. P. Bufalino (UMO). *Howell County*, Willow Springs, before December 1959, N. Banks (MCZ). *Iron County*, Graniteville, 20 March 1955, R. E. Crabill (NMNH); 16 km W Ironton, 25 August 1965, R. L. Mondale (CAS); and Ironton, 5 August 1965–31 July 1966, R. L. Mondale (CAS). *Jackson County*, Kansas City, 3 July 1955 (CAS). *Jasper County*, Joplin, Fall 1984 (WDS). *Jefferson County*, Pevely, 23 April 1956, J. M. Kingsolver (INHS). *Madison County*, Fredericktown, 29 July 1967–19 August 1968, R. L. Mondale (CAS). *Miller County*, 3.2 km SE Brumley, 16 June 1967, M. A. Nickerson (CAS). *Moniteau County*, 5 September 1961, E. McDaniel (CAS). *Oregon County*, Alton, May 1956, W. F. Rush-ton (MCZ). *Phelps County*, Rolla, April 1964, J. R. Waring (AMNH). *St. Clair County*, 16 km NE Osceola, 11 July 1955, P. Anderson (AMNH); and Collins, 17 July 1956 (CAS). *St. Genevieve County*, 6 June 1937 (FMNH); Misplay Glade nr. Co. Rd. DD, no date, T. Yamashita (TY); and St. Genevieve, 31 May 1956, H. A. Lowenstam (INHS). *St. Louis County*, St. Louis, September 1929, P. Paul (NMNH) and 29 March 1963, K. Rhoads (CAS); Glencoe, 25 April 1962, K. Rhoads (CAS); Ranken, 21 July 1929–14 May 1933 and 29 July 1945, E. P. Meiner (NMNH, UMO); Kirkwood (NMNH); and Eureka, 6–7 March 1963, K. Rhoads (CAS). *Stone County*, 6 October 1973, C. R. Mappes (UMO); N Kimberling City, Table Rock L., Joe Bald area, 25 May 1974, S. E. Thewke (UMO); Notch, 27 August–4 September 1924, A. B. Wolcott (FMNH); and Cape Fair, 14 April 1954, Bagby (MCZ). *Taney County*, Hollister, 19 August 1962, J. C. Johnson (CAS). *Washington County*, Washington St. Pk., 16 May 1943, C. J. Goodnight (AMNH). *County unknown*, Osage Bluff, 1940 (NMNH). **NEBRASKA**: *Thayer County*, Williams, 2 May 1948, Jones & Loomis (FSCA); 4 km N Gilead, 12 July 1982, W. F. Rapp (AMNH, WFR); Gilead, 22 September 1982 and 25 May 1983, Rapp (WFR); and Alexandria, 24 June and 22 September 1982, Rapp (AMNH, WFR). **NEW MEXICO**: *Chaves County*, 11.2 km E Roswell, along Pecos R., 29 July 1956, V. Roth, W. J. Gertsch (AMNH). *De Baca County*, 28.8 km S Taiban, 10 September 1958, D. Hall (CAS). *Dona Ana County*, University Park, 8 July 1967, B. A. Smith (CAS); and Las Cruces, 22 October 1975, T. Schowalter (UGA). *Eddy County*, Carlsbad, 19 June and 21 July 1964, H. T. Hoskins, R. W. Reeves (CAS); Whites City, 24 September 1950 (AMNH) and 5 October 1961, W. J. Gertsch, W. Ivie (AMNH); Carlsbad Caverns Nat. Pk., 1 September 1947 (CAS); and 43.2 km SW Carlsbad, 18–25 July 1964, P. G. Sanchez, R. W. Reeves, P. F. Van Cleave (CAS). *Guadalupe County*, 4.8 km N Vaughn, 18 August 1958, T. Marquez (CAS). *Lincoln County*, 9.6 km W Carrizozo, Malpais Lava Flow, 27 June 1947 (CAS). *Otero County*, La Luz, 10 August 1959, R. A. Miller (CAS). *Quay County*, Ft. Bascoms, now in Tucumcari (NMNH). *San Miguel County*, Las Vegas (INHS), 3 September 1963, L. Nichols, and 13–15 1968, M. Gratten, H. L. Stahnke (CAS); 1.6 km S Las Vegas, 28 September 1965, H. Trujillo (CAS); nr Las Vegas (Hot Spgs.), August 1901, Schwarz (NMNH); and Montezuma, 27 August 1958, W. L. Smith (CAS). *Socorro County*, Mockingbird Gap, S of Oscura Mts., 5 August 1967, C. H. Lowe (AMNH). **OKLAHOMA**: *Alfalfa County*, Cherokee, 6 November 1961, B. Young (CAS), and 8 and 12.8 km S Cherokee, 2 and 18 October 1961, J. Herrington (CAS). *Beckham County*, Sayre (CAS). *Blaine County*, Brown Nose St. Pk., R. L. Landie (OKSU). *Carter County*, Ardmore, October 1954 (CAS). *Cherokee County*, Hulbert, 10 November 1954, R. N. Van Noy (OMNH). *Cimarron County*, 24 km N, 11.2 km W Boise City, 22 June 1966, D. C. Arnold (OKSU). *Cleveland County*, Norman, 7 February 1932, H. Fisher (OMNH), 15 August 1959, J. Ward (MCZ), and 13 October 1975, C. Treaftig (OMNH); and L. Thunderbird, 16 October 1968, R. M. Waering (FSCA). *Comanche County*, Wichita Mts. Nat. Wildlife Ref., 20 July 1932, H. Fisher (OMNH), 6 June 1939, E. Hixon (CAS), 3 September 1949, C. J. Goodnight (AMNH), 9 March 1963, G. L. Rotramel (INHS), and 30 March 1981, J. M. Carpenter (MCZ). *Craig County*, 15 April 1960, Os-ume (OKSU). *Dewey County*, 1.6 km N Taloga, along US hwy. 183 at S. Canadian R. 18 April 1980, S. K.

Wu, P. B. LaRochelle (UCO). *Ellis County*, L. Lloyd Vincent, 14 October 1967, D. C. Arnold (OKSU). *Garfield County*, 9.6 km E, 3.2 km S Bison, 20 August 1989, R. L. Landie (OKSU). *Greer County*, Quartz Mtn. St. Pk., 20 September 1952 (NMNH) and 4 June 1954, P. W. Smith (INHS). *Harper County*, 4.8 km N, 3.2 km W Ft. Supply, 22 September 1957, Harper (OKSU). *Haskell County*, Kinto, 4 November 1988, L. Felchick (OKSU). *Hughes County*, 10 December 1933, J. R. Carpenter (OMNH). *Kay County*, Ponca City, 15 October 1975 (OKSU). *Latimer County*, 13 April and 11 June 1931, R. D. Bird (OMNH). *LeFlore County*, nr. Poteau, 16 May 1961 (OKSU). *McClain County*, Johnson's Pasture, 16 February 1935 (OMNH). *Marshall County*, 3.2 km W Willis, along Cowan Cr., 27 June 1958, B. A. Branson (INHS); and L. Texoma, 16 August 1965, B. Rotramel (INHS). *Murray County*, Sulphur, 15–28 June and 20 August 1956 (CAS). *Muskogee County*, 3 August 1978, B. G. Hill (OKSU). *Osage County*, Hulah, 7 May 1985 (MCZ); and Osage Hills St. Pk., 12 October 1985, Blackwood (OKSU). *Pawnee County*, Pawnee, 33 September 1963, M. E. Sisk (OKSU). *Payne County*, Stillwater, 20 November 1990 and 24 November 1963, D. C. Arnold (OKSU) and spring 1970, L. T. Chapin (LSU); and nr. L. Blackwell, 22 March 1990, M. Lee (OKSU). *Pottawatomie County*, Pearson, 26 February 1974, D. C. Arnold (OKSU); and Shawnee, 18 May 1952, J. M. W. (OMNH). *Roger Mills County*, Cheyenne, 5 August 1953, M. C. Sooter (FSCA). *Seminole County*, May 1930 (OMNH). *Sequoyah County*, nr. Sallisaw, 30 June 1961 (OKSU). *Stephens County*, 9.6–11.2 km E Duncan, KX Ranch, 1981, R. E. Knight (MCZ); and Comanche, 15 March 1972, D. C. Arnold (OKSU). *Tillman County*, 14.4 km S Davidson, along Red R., 15 May 1960, M. B. Lamb (OKSU). *Tulsa County*, Tulsa, 1 October 1951 (CAS), and 6 September 1966, R. M. Waering (FSCA). *Woodward County*, vic. Alabaster Caverns St. Pk., 5–11 October 1952 (AMNH). **TEXAS:** Samples were examined which produced the following 59 new county records: Anderson, Angelina, Atascosa, Bandera, Bastrop, Baylor, Brazoria, Brazos, Briscoe, Brown, Burnet, Calhoun, Camp, Cherokee, Comal, Coryell, Ector, El Paso, Fisher, Gray, Harris, Harrison, Hays, Houston, Hudspeth, Hutchinson, Jones, Kendall, Lamar, Lampasas, Leon, Liberty, Llano, Live Oak, Madison, Matagorda, McLennon, Milam, Mitchell, Montague, Moore, Newton, Nolan, Nueces, Palo Pinto, Polk, Potter, Randall, Refugio, Robertson, Runnels, Rusk, San Augustine, Smith, Sterling, Tarrant, Upton, Walker, and Wilbarger (Depositories: AMNH, ANSP, INHS, FMNH, OMNH, SEM, SFAU, TAMU, UGA, UTEP, WDS, WTAMU). Sight records (K. J. McWest, in litt. to second author, 1994): Bell, Callahan, Collin, Eastland, Jasper, Montgomery, Nacogdoches, Rockwall, San Jacinto, and Shelby. These new records and observations bring to 135 the total number of counties in Texas from which *C. vittatus* has been recorded. **MEXICO: CHIHUAHUA:** Below

Sierra Ponce, S of Santa Elena (across border from Castolon, Tx.), March 1991, P. Klawinski, P. Monk, R. Truss (SFAU). **COAHUILA:** Saltillo, 23 May 1952, Cazier, Gertsch, Schramme (NMNH); 20 km N Saltillo, 6 Jan 1977, Cokendolpher and Dalquest (MWSU); 40 km N Saltillo, 6 Aug 1972, J. Kaspar (MWSU); Los Pinas, 17.3 km S, 0.2 km E Arteaga, 14 July 1977, Liner, Chaney (FSCA); 24 November 1977, Liner, Bartlett (FSCA); and 17 July 1975, Liner (FSCA). Valle de Guerra, 8.6 km W Bunuelos, 15 July 1977, Liner, Chaney (FSCA). Campo Central, 48 km SE Boquillas (FMNH). 33.6 km NW Ciudad Melchor Muzquiz, 21 July 1972, Liner, Johnson, Chaney (FSCA). Sierra de Penetente, Saltillo to Diamante, 2,340 m, 13 July 1934 (ANSP). Tinajas de Chaves, 32 km S Boquillas, 8 April 1945, K. P. Schmidt (FMNH). **NUEVO LEON:** Km 888 Hualahuises, 10 January 1948 (AMNH). 9.1 km SSW Cerralvo, 14 July 1975, E. A. Liner et al. (FSCA). Montemorelos (FMNH). 32 km N Montemorelos, 16 June 1941, H. S. Dybas (FMNH). Monterrey, 14 June 1941, Dybas (FMNH). 1.0 km S Portrero, Arroyo Mesquiteal, 16 July 1974, Liner, R. M. Johnson, A. H. Chaney (FSCA). 3.2 km W, 2.2 km S San Antonio de las Alazanas, Cienega del Toro Rd., 24 November 1977, Liner, P. Bartlett (FSCA). 2.2 km SW San Isidro, 22 July 1976, Liner et al. (FSCA). 23 km E San Jose de Iturbide, 21 July 1976, Liner et al. (FSCA). 4.8 km S Galeana, 22 May 1973, D. A. Rossman (FSCA). Picacho Mts., 9.8 km SW, 11.8 km NW Cerralvo, Rancho El Milagro, 11 July 1977, Liner, Chaney (FSCA). 2.9 km E San Juan Batista, 12 July 1977, Liner, Chaney (FSCA). San Juan Batista to La Cienega, Canon San Juan Batista, 15 July 1974, Liner et al. (FSCA). Cienega de Flores, 14 June 1941, Dybas (FMNH). **TAMAULIPAS:** Reynosa, C. C. Hoffmann (AMNH). W of Matamoros, 13 October 1985, H. R. Hermann (UGA). Ciudad Victoria, 17 May 1952 (NMNH) and 17 May 1952, W. J. Gertsch, M. Cazier, R. Schramme (AMNH). Abasolo, 17 May 1952, Cazier, Gertsch, Schramme (NMNH). El Tinieblo, 12 March 1972, B. D. Campbell, R. W. Mitchell (AMNH) and 6 March 1977, R. W. Mitchell (AMNH). Padilla, 17 May 1952, Cazier, Gertsch, Schramme (AMNH). Jimenez, 15 May 1952, Cazier, Gertsch, Schramme (NMNH). La Reforma, 15 October 1984, P. Sprouse (TMM). Sistemica Purificacion, 26 November 1979, P. Sprouse (TMM).

**Human importation to others areas.**—Specimens that are believed to represent accidental human importations were examined from the following localities. The possibility also exists that some of the specimens below bear erroneous locality data. The specimen from Chicago was encountered in a street, and those from Dare and Wake counties, North Carolina, and Rankin County, Mississippi, were taken in buildings. Juveniles have been collected in Rutherford County, Tennessee, indicating the probable existence of an established, reproducing population (Denise Due, Vanderbilt Univ., pers. comm. to second author, 1981).



**CALIFORNIA:** *Contra Costa County*, Richmond, August 1952 (CAS). **ARIZONA:** *Maricopa County*, Phoenix, 22 March 1952, S. Smith (CAS). *County unknown*, Kamah, P. A. Vestal (MCZ). **COLORADO:** *Boulder County*, Boulder, 8 June 1954 (CAS). **IOWA:** *County unknown*, Missouri Valley, 4 August 1941 (CAS). **MISSOURI:** *Clark County*, Fairmont (CAS). **ILLINOIS:** *Cook County*, Chicago, 3 June 1922, M. Jensen (FMNH). *McHenry County*, Woodstock, October 1951 (CAS). **KENTUCKY:** *Marshall/Calloway Counties*, Kentucky L., 15 August 1975 (INHS). **TENNESSEE:** *Rutherford County*, Tiger Hill nr. Murfreesboro, November 1981 (WDS). *Shelby County*, Memphis, 13 August 1955 (CAS), and January 1963, O. E. Smith (CAS). **LOUISIANA:** *East Baton Rouge Parish*, Baton Rouge, November 1962, T. B. Murrell (LSU) and 12 October 1983, M. Villars (LSU). *Orleans Parish*, New Orleans, 31 July 1962, P. Esteve (CAS). *County unknown*, Mississippi River (NMNH). **MISSISSIPPI:** *Lamar County*, nr. Sumrall, summer 1989 (MMNS). *Pike County*, Summit, September 1966, J. D. Smith (CAS). *Rankin County*, Brandon, 7 August 1990, B. Tanner (MEM). **NORTH CAROLINA:** *Dare County*, Nags Head, 10 May 1986, L. Griffin (NCSU). *Nash County*, Rocky Mount, 26 July 1991 (NCSM). *Wake County*, Research Triangle Park, August 1991 (NCSM); and Raleigh, Wakefield St., 24 October 1986, M. A. Brittain (NCSU) and Bland Rd., 13 May 1991, J. Wigmore (NCSM).

It is also noteworthy that *C. vittatus* may have been introduced abroad as well. At least, there are some specimens in museum collections bearing labels from locations in South America. Sissom & Lourenço (1987) discovered that the species *C. dasypus* Mello-Leitão described from Andahuaylas, Peru was in fact *C. vittatus*. These specimens were probably mislabeled, as the locality is deep in the mountainous interior of the country. There are also several specimens of *C. vittatus* from Caracas, Venezuela in the Field Museum of Natural History, Chicago.

#### *Centruroides hentzi* (Banks)

Figs. 3, 5, 6, 7

**Habitat.**—According to Muma (1967), *C. hentzi* usually occurs under litter, logs, and stones in Florida; it can also be found under bark of dead trees and often enters houses. North of Florida, specimens were encountered under pine and oak bark in Camden and Charlton counties, Georgia, respectively, and inside houses, condominiums, or dormitories in Charlton County, Georgia; Charleston County, South Carolina; and Durham, Carteret, and Brunswick counties, North Carolina. Of the six specimens seen at the South Carolina site, two have been preserved, one of which was in a sleeve of a robe and stung

the collector when she tried to put on the robe (Langley 1994).

**Distribution.**—In the United States, *C. hentzi* was previously known only from Florida, where it occurs statewide (Muma 1967); it can now be reported from adjacent parts of Alabama and Georgia, where it would logically be anticipated (Figs. 6, 7). In Georgia, the scorpion appears to be common in the southern tier of counties adjacent to Florida; it occurs offshore on Cumberland Island, and these specimens constitute topotypes of *Buthus vittatus* Say. The westernmost locality, Mobile, Alabama, establishes *C. hentzi* west of the Alabama River and suggests eventual discovery in southeastern Mississippi. Specimens from outside of Florida that are believed to represent natural occurrences were examined from the following localities:

**ALABAMA:** *Baldwin County*, Bon Secour Nat. Wildlife Ref., along AL hwy. 180 ca. 19.2 km W Gulf Shores and 41.6 km W Florida State/Escambia County line, 17 April 1993, R. L. Brown (MEM); and Josephine, 29 December 1993 (NCSM). *Mobile County*, Mobile, H. P. Loding (AMNH). **GEORGIA:** *Camden County*, private land on Cumberland Island, 25 December 1993, C. Ruckdeschel, C. R. Shoop (CIM, NCSM, NMNH, WDS). *Charlton County*, 6.4 km W Folkston, 19 March 1936, F. Harper (NMNH); and Okefenokee Natl. Wildlife Ref., 13 June 1981, C. L. Smith, S. N. Brown (UGA) and Billy's Island, 29 January 1978, D. H. Habeck (FSCA). *Clinch County*, 22.4 km N Fargo, 25 December 1949, Smith & Smith (INHS). *Cook County*, Adel, Fall 1937, J. T. Dampier (NMNH). *Lowndes County*, 4.8 km NW Valdosta, March 1976, D. Daleske (FMNH). *Mitchell County*, 6.4 km N Sale City, 27 November 1949, J. W. Crenshaw (FSCA). *Thomas County*, 20 April 1973 and 6 January 1976, W. T. Sedgwick (MCZ); Thomasville, 9 December 1903, M. Hebard (ANSP), March 1939, J. White (FMNH) and May 1942, E. Ireland (FMNH); 16 km S Thomasville (Birdsong Plantation), 15 April 1945, D. C. Lowrie (FMNH); and Millpond Plantation, 3 March 1973 (MCZ). *Ware County*, Waycross, 8 May 1937, T. H. Hubbell (CAS); 16 km SE Waycross, 16 March 1963, H. W. & L. R. Levi (MCZ); and Laura Walker St. Pk., 19 February 1988, W. E. Steiner, J. B. Stribling (NMNH). *County unknown*, Clermont, 21 June 1955, A. W. Vasquez (NMNH).

**Human importation to other areas.**—Specimens that are believed to represent accidental human introductions were examined from the following localities. The samples from Georgia could conceivably represent natural occurrence because these two counties, in the Fall Zone and outer periphery of the Piedmont Plateau, ca. 160 km from the most proximate locality, are not so remote as to be implausible indigenous records, par-

ticularly if *C. hentzi* occurs northward in the Gulf Coastal Plain. However, they are detached from the clustered and unquestionably native records in southern Georgia and are therefore treated as introductions. The specimens from South Carolina and Brunswick County, North Carolina, were possibly imported with Florida palm trees that have been planted along the coast of the Carolinas (J. Morse, pers. comm). Reproducing populations have not been verified at any of the following sites.

**GEORGIA:** *Harris County*, 10 May 1970 (CC). *Muscogee County*, Columbus, 17 May 1959 (CC). **NORTH CAROLINA:** *Brunswick County*, Bald Head I., February 1993 (NCSM) and 1.6 km E of Marina, July 1992 (RNH). *Carteret County*, Bogue Banks, Emerald Isle, September 1993, D. McLuskey (NCSM). *Durham County*, Duke Univ., 8 September 1987, C. Brock (NCSU). **SOUTH CAROLINA:** *Charleston County*, Isle of Palms, 20 February 1994, S. Mims (NCSM).

#### COMPARISON OF SCORPION DISTRIBUTIONS IN THE EASTERN UNITED STATES

The known indigenous distributions of the scorpions in the United States east of the Central Plains are compared in Fig. 7; the ranges of *C. gracilis* and *C. guanensis* (= *C. keysi*), and *V. carolinianus* are adapted from maps published by Muma (1967) and Shelley (1994a), respectively. There is no known overlap between *V. carolinianus* and any of the buthids, although its range is only about 112 km north of that of *C. hentzi* in southern Alabama. According to Muma (1967), *C. guanensis* is restricted to Collier, Dade, and Monroe counties, Florida. *Centruroides gracilis* is indigenous to the peninsula from Alachua County southward. To our knowledge, these distributions are still current, but we did discover the following two samples of *C. gracilis*, representing accidental human importations, from well outside this area.

**MISSISSIPPI:** *Rankin County*, in concrete debris at truck stop on US hwy. 49 just S I-20, nr. Jackson, 27 October 1983, E. S. Olson (MMNS). **TEXAS:** *Galveston County*, Galveston, 1935 (NMNH).

Additionally, there is an individual of *C. gracilis* from Dallas, Texas (NMNH), that was taken in 1956 "in produce from Central America," and another collected in 1930 on a ship berthed at New Orleans (NMNH).

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